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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/050,195	01/16/2002	Sang-Bom Kang	5649-912	6301
20792	7590	09/25/2007		
MYERS BIGEL SIBLEY & SAJOVEC			EXAMINER	
PO BOX 37428			IM, JUNGHWA M	
RALEIGH, NC 27627				
			ART UNIT	PAPER NUMBER
			2811	
			MAIL DATE	DELIVERY MODE
			09/25/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/050,195

Applicant(s)

KANG ET AL.

Examiner

Junghwa M. Im

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 June 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3-7,13,14 and 25-31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1,3-7,13,14 and 25-31 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-7, 13, 25-29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. (US 5,672,543), hereinafter Chang in view of Taguwa et al. (US 6,107,190), hereinafter Taguwa and Moise et al. (US 6,534,809), hereinafter Moise.

Regarding claims 1 and 25, Fig.1 of Chang shows a contact plug in an insulating layer 20 having tensile stress (col. 1, lines 53-54), a TiN layer 26 surrounding the plug on contact and having compressive stress (col. 1, lines 32-33) and an ohmic layer 24 between the insulating layer and the TiN layer.

Chang discloses substantially the entire claimed device except a TiN plug. Taguwa teaches a TiN plug having a tensile stress (col. 2, lines 33-39) in lieu of W plug of Chang. It would have been obvious to one of ordinary skill in the art at the time of the invention to form a TiN plug in the device of Chang with Taguwa's teaching in order to reduced a production cost as taught in column 1, lines 57-61 of Taguwa.

The device with the teachings of Chang and Taguwa fails to show that a lower electrode of the capacitor structure contacting the upper surface of the TiN plug. Fig.1 of Moise shows a bottom electrode 124 of a capacitor 125 formed on a TiN contact plug 114 and a TiN liner layer (col. 7, lines 43-50).

It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate Moise's teaching to the device of Chang and Taguwa in order to fabricate a DRAM array with a charge storage capacitor.

Regarding claim 3, the liner of Chang inherently possesses an amorphous structure since it is deposited by CVD.

Regarding claims 4-5, Fig. 1 of Chang shows an ohmic layer, Ti 24 between the liner and the insulating layer.

Regarding claim 6, the combination of Chang/Taguwa/Mori does not explicitly disclose the thickness of the ohmic layer as claimed. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to have the recited range of the thickness for an ohmic layer to improve the conductivity, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 7, the combination of Chang/Taguwa/Mori does not explicitly show the thickness of the liner layer as claimed. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to have the recited range of the thickness for an liner layer to enhance the adherence, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 13, Fig.1 of Moise shows a capacitor 125 formed on a contact plug 114 and a capacitor with a lower electrode 124 made of Pt (col. 9, lines 27-39).

Regarding claim 26, Taguwa discloses a TiN plug formed by CVD (col.1, lines 57-61).

Regarding claim 27, Chang discloses a TiN layer formed by CVD (col. 3, lines 13-14). In addition, CVD, ALD, CVD AND ALD are a process designation and would thus not carry patentable weight in this claim drawn to a product. See *In re Thorp*, 227 USPQ 964 (Fed. Cir. 1985).

Regarding claim 28, Chang discloses a TiN layer has an amorphous crystal structure since it is deposited by PVC.

Regarding claim 29, Chang discloses a TiN liner formed by physical vapor deposition (col. 3, line 13). In addition, IPVD is a process designation and would thus not carry patentable weight in this claim drawn to a product. See *In re Thorp*, 227 USPQ 964 (Fed. Cir. 1985).

Regarding claim 31, Moise shows the upper conductive layer made of Pt (col.9, lines 30-33).

Regarding claim 32, Moise shows the upper conductive layer (51) comprising a lower electrode of a capacitor (col. 9, lines 27-29).

Claims 14 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang in view of Mori and Taguwa applied to claims 1 and 25 further in view of Nagasaka et al. (US 6,300,683), hereinafter Nagasaka.

Regarding claims 14 and 30, the combination of Chang/Mori/Taguwa discloses most aspects of the instant invention except a shape of the contact plug. However, Fig. 19D of Nagasaka shows a tapered contact plug 12.

It would have been obvious to one of ordinary skill in the art at the time of the invention to form a tapered contact plug of Chang/Mori/Taguwa with Nagasaka's teaching in order to form

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the plug without cracks. It is well known in the art that it is easier to fill contact/plug openings with tapered sidewalls.

### ***Response to Arguments***

Applicant's arguments filed June 22, 2007 have been fully considered but they are not persuasive.

Applicants argue that the combination of Chang/Mori/Taguwa would not show the limitations recited in claims 1 and 25. In particular, Applicants argue that “[t]he Moise reference fails to provide the teachings missing from Chang and Taguwa. As shown in FIG. 1 and described at col. 9, lines 27 - 30, Moise discloses a capacitor 125 that may be formed on a plug 114 or a barrier layer 122. Moise does not include any disclosure or suggestion of forming a capacitor that has a lower electrode that contacts both an upper surface of a TiN contact plug and an upper surface of a TiN liner.” This is not persuasive. Fig. 1 of Moise shows a lower electrode 124 of a capacitor 125 formed on an upper surface of the plug 114 and a liner/barrier layer 116, and the combination of Chang/Taguwa shows a TiN contact plug with tensile and a TiN liner having compressive stress. Therefore, the combination of Chang/Mori/Taguwa would show all the limitations recited in claim 1 and 25.

Applicants further argue that “Applicants further submit that there would be no motivation for combining the teachings from these three different references. .... It appears, therefore, that the Office Action gains its alleged impetus or suggestion to combine the cited references by hindsight reasoning informed by Appellants’ disclosure, which is an inappropriate basis for combining references.” However, there is no requirement that a motivation to make the

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modification be expressly articulated. The test for combining references is what the combination of disclosures taken as a whole would suggest to one of ordinary skill in the art. *In re McLaughlin*, 170 USPQ 209 (CCPA1971). References are evaluated by what they suggest to one versed in the art, rather than by their specific disclosures. *In re Bozek*, 163 USPQ 595 (CCPA) 1969. In addition, applicant's argument of "hindsight reasoning informed by Appellants' disclosure" is merely speculative without substantiation.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

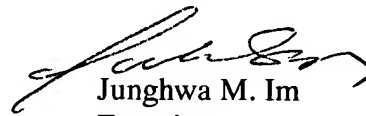
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (571) 272-1655. The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne A. Gurley can be reached on (571) 272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Junghwa M. Im  
Examiner  
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jmi  
9/9/2007